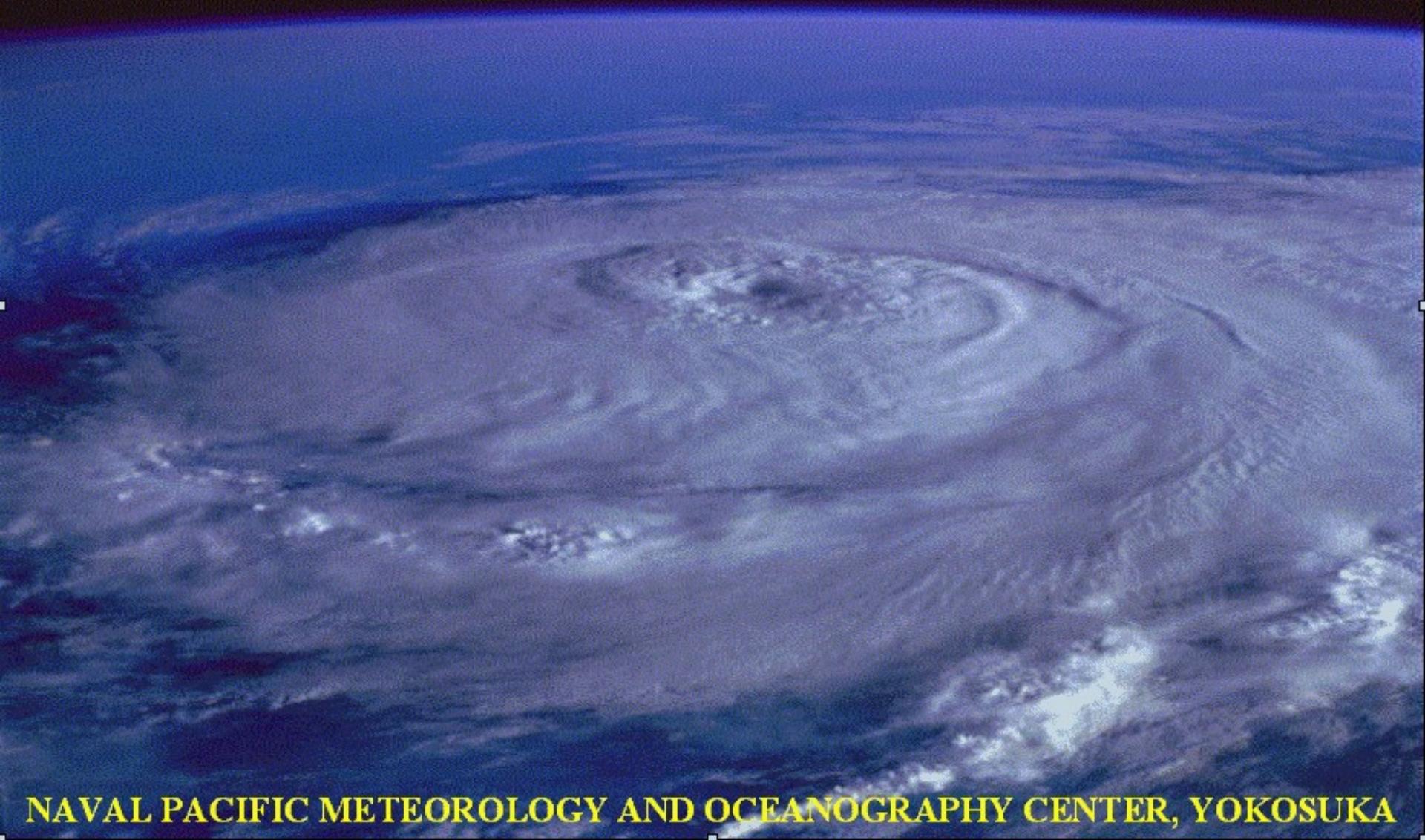


Tropical Cyclone Evasion



NAVAL PACIFIC METEOROLOGY AND OCEANOGRAPHY CENTER, YOKOSUKA

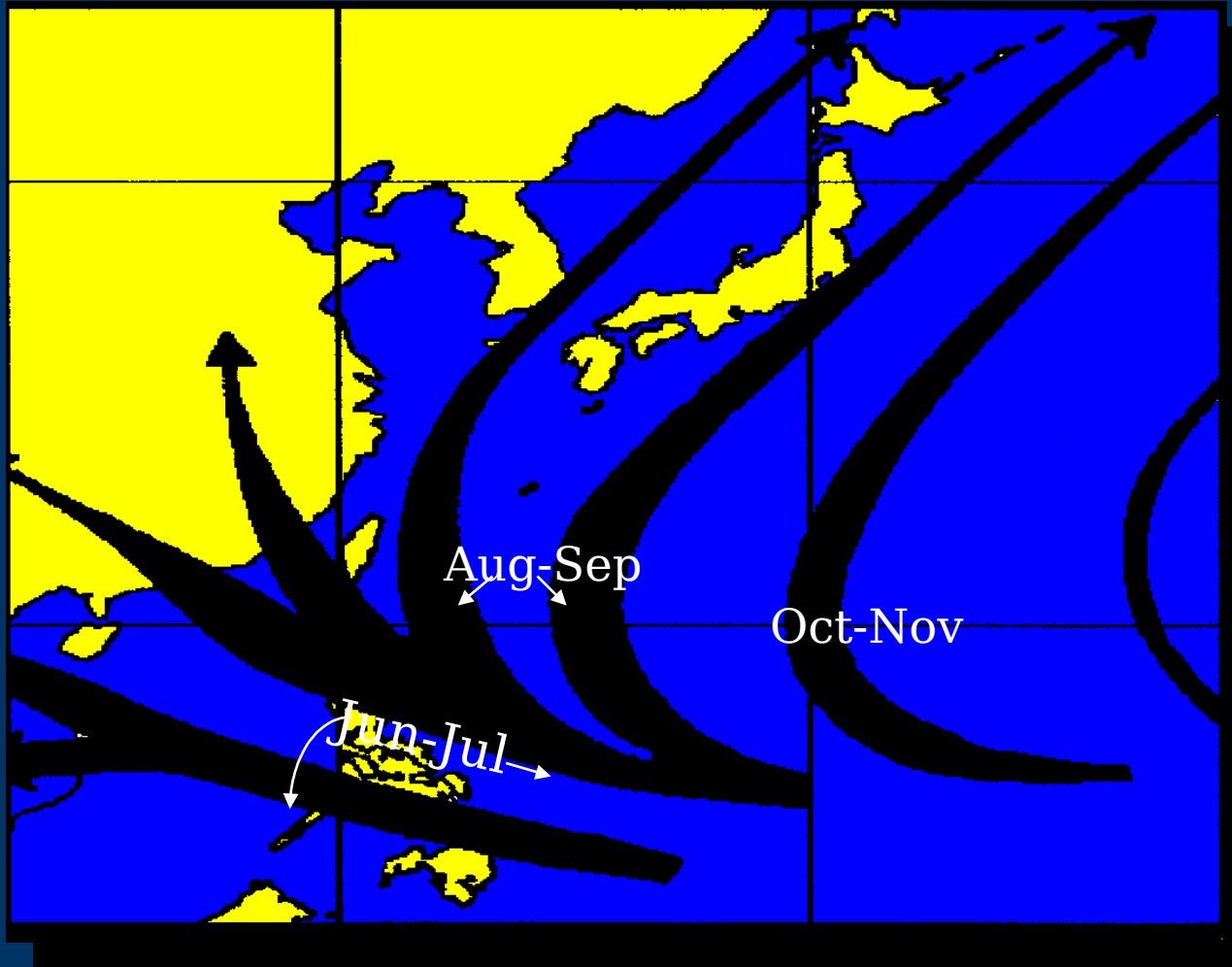
Overview

- WESTPAC CLIMATOLOGY
- U.S. NAVY WARNING SYSTEM
- TROPICAL CYCLONE DEVELOPMENT
- TYPHOON EVASION
- TYPHOON HAVENS
- CONDITIONS OF READINESS
- REQUIRED REPORTS

West Pac Climatology

- **SEASON-** year round; most frequent June through November (August is most active)
- **FORMATION AREA-** Philippine Sea, South China Sea and between 5 and 15 degrees latitude
- **NUMBER-** average 25 tropical cyclones, 18 typhoons, 5 super typhoons per season
- **MOVEMENT-** generally WNW-NE
- **SPEED-** 10 to 15 KTS (may be stationary or accelerate to 50 KTS)

Average Storm Track for WestPac



Storms Affecting Yokosuka

- **SEASON - JUNE THROUGH NOVEMBER**
 - average of 2 per year pass within 180 NM of Yokosuka and most storms
 - are in re-curvature moving NE at 18-35 KTS
- **STORMS PASSING TO THE WEST**
 - winds are the strongest and from a southerly direction
 - wave action import is limited, 3-5 feet
- **STORMS PASSING TO THE EAST**
 - winds not as strong and from NE
 - increased wave action, harbor can reach in excess of 8-10 ft

U.S. NAVY Warning System

JOINT TYPHOON WARNING CENTER, PEARL HARBOR HI

- TDO is a USN or USAF 0-3 or 0-4
- Issues advisories, TCFA's, TC warnings, prognostic reasoning
GOMM) 808- 474-2320
- Call anytime - *(~~DSN~~)^{SECURE}474-

2320*

****OFFICIAL NAVY FORECAST ****

U.S. NAVY Warning System

OTSR

- OTSR Duty Officer is a USN E-7 ~ O-3
- Issues advisories and divert/sortie recommendations

(COMM) 011-81-311-743-

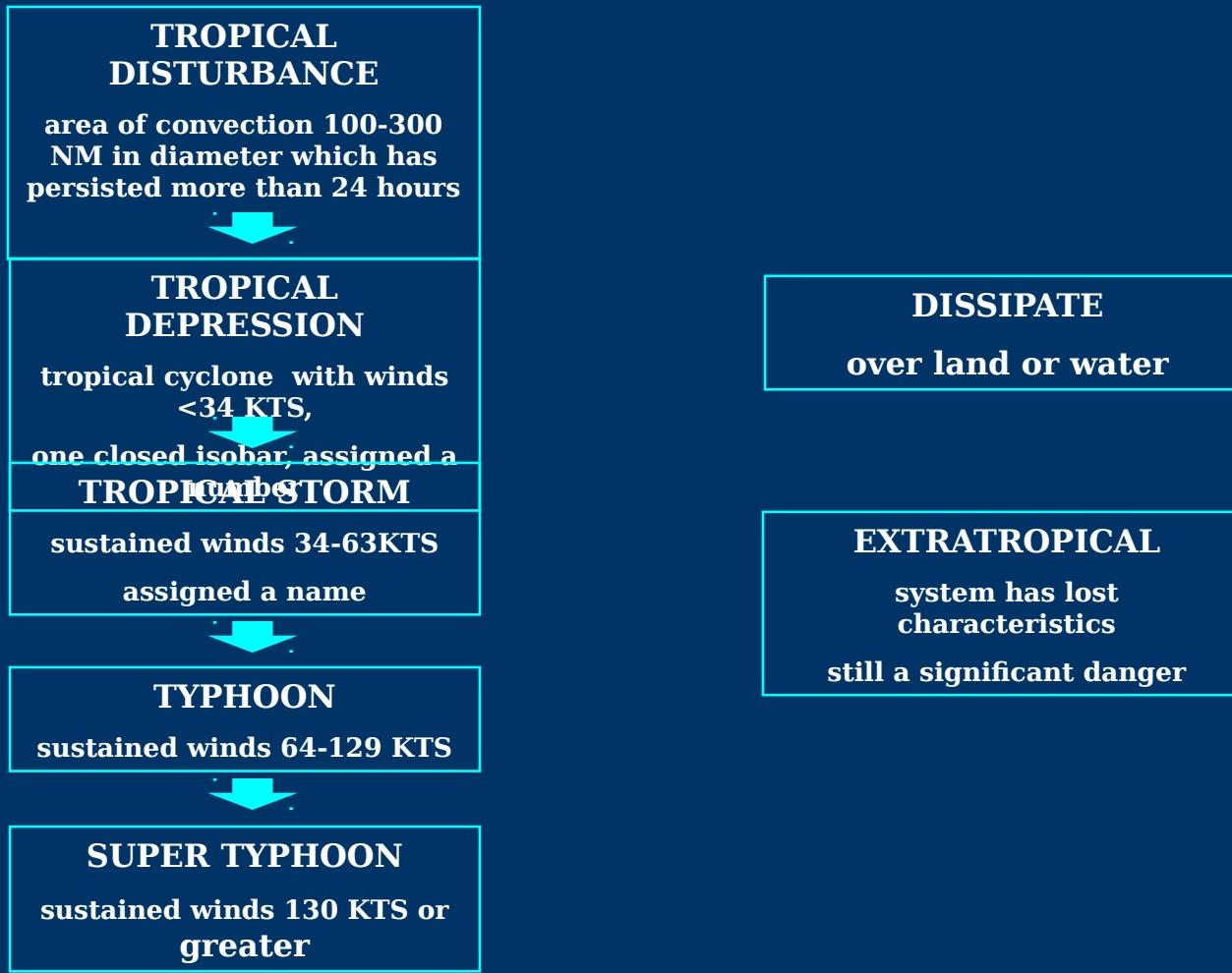
- Call anytime - ~~(DSN)~~^{8873*}243-
~~8873*~~
- **OFFICIAL NAVY FORECAST **

Tropical Cyclone Development

Conditions for Development

- Warm Sea Surface Temp (>79 Deg F)
- Pre-Existing Surface Disturbance
- Minimal Vertical Wind Shear
- Poleward of 5 Deg Latitude

Life Cycle of a Tropical Storm



Tropical Cyclone Formations

A grayscale satellite image showing the development of a tropical cyclone. It features concentric bands of clouds around a central eye, with the most intense convection at the center. Four callout boxes with arrows point to specific features: 'TROPICAL STORM' points to the outer edge of the cloud banding; 'HURRICANE E/TYPHOO N >63 KTS' points to the central eye; 'TROPICAL DISTURBANCE' points to the bottom right, showing early cloud formations; and 'TROPICAL DEPRESSION <34 KTS' points to the top right, showing a less organized cluster of clouds.

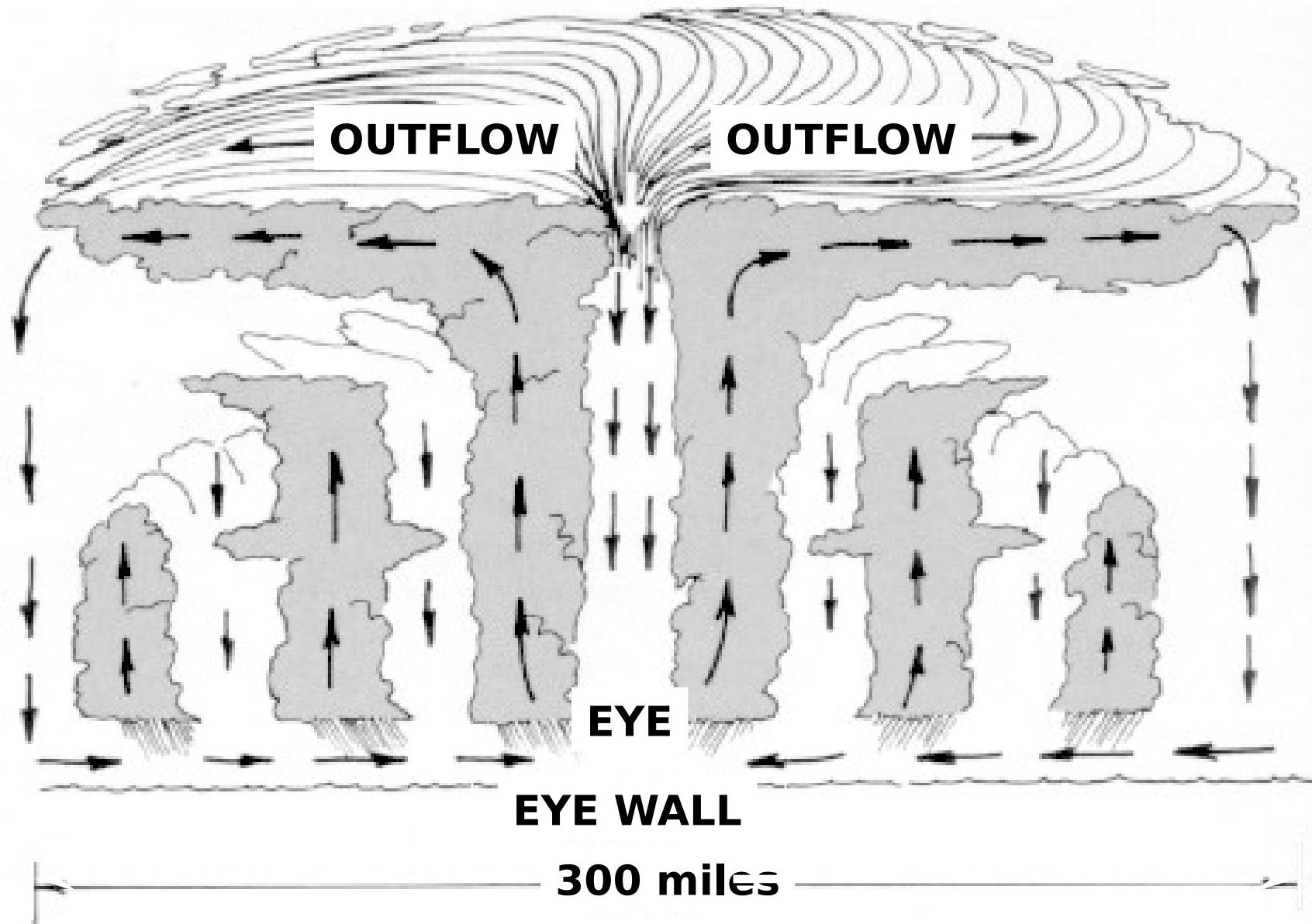
TROPICAL STORM
34-63 KTS

TROPICAL DEPRESSION
<34 KTS

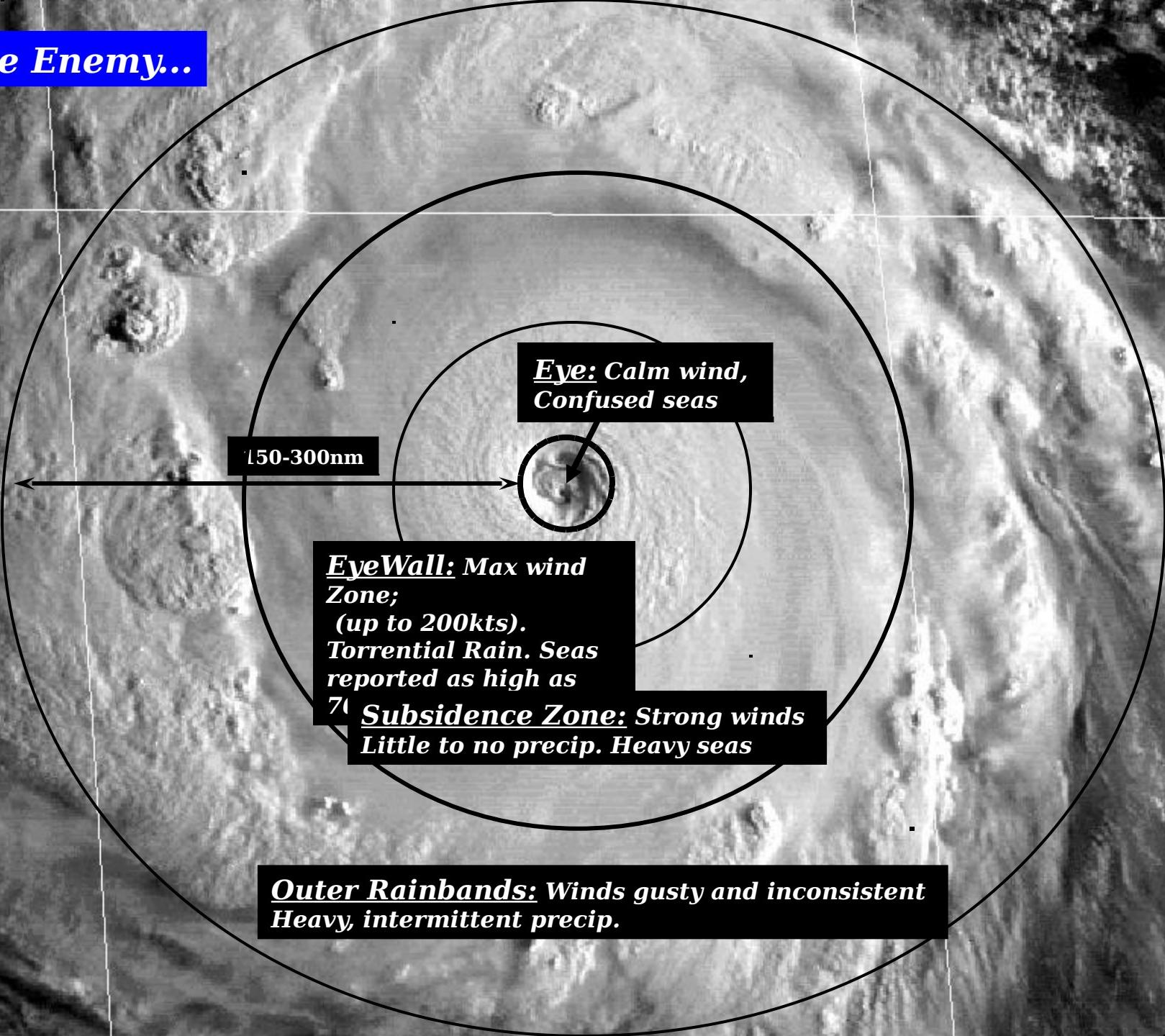
**HURRICANE
E/TYPHOO
N**
>63 KTS

TROPICAL DISTURBANCE

Storm Structure



The Enemy...

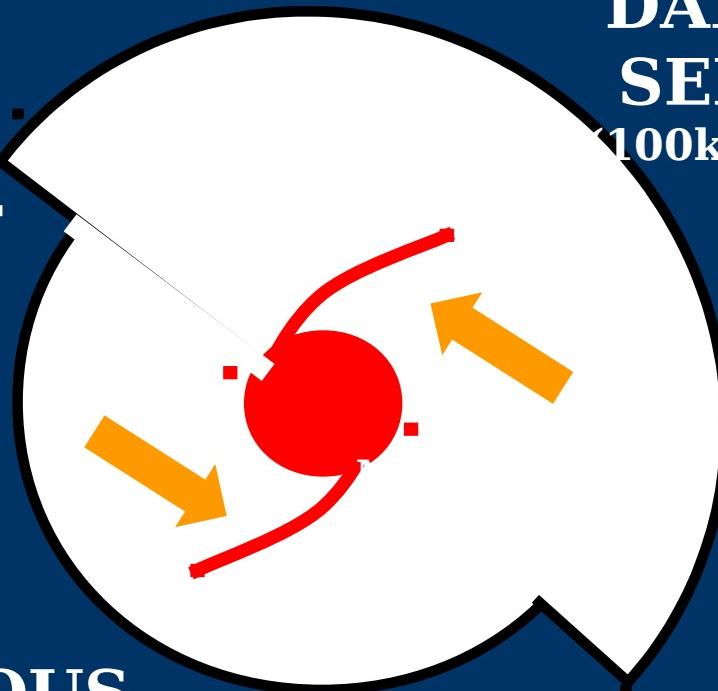


Some Definitions



DIRECTION OF
MOVEMENT
(NW@12kt)

LESS DANGEROUS
SEMICIRCLE
(100kt - 12kt = 88kt)



DANGEROUS
SEMICIRCLE
(100kt + 12kt = 112kt)

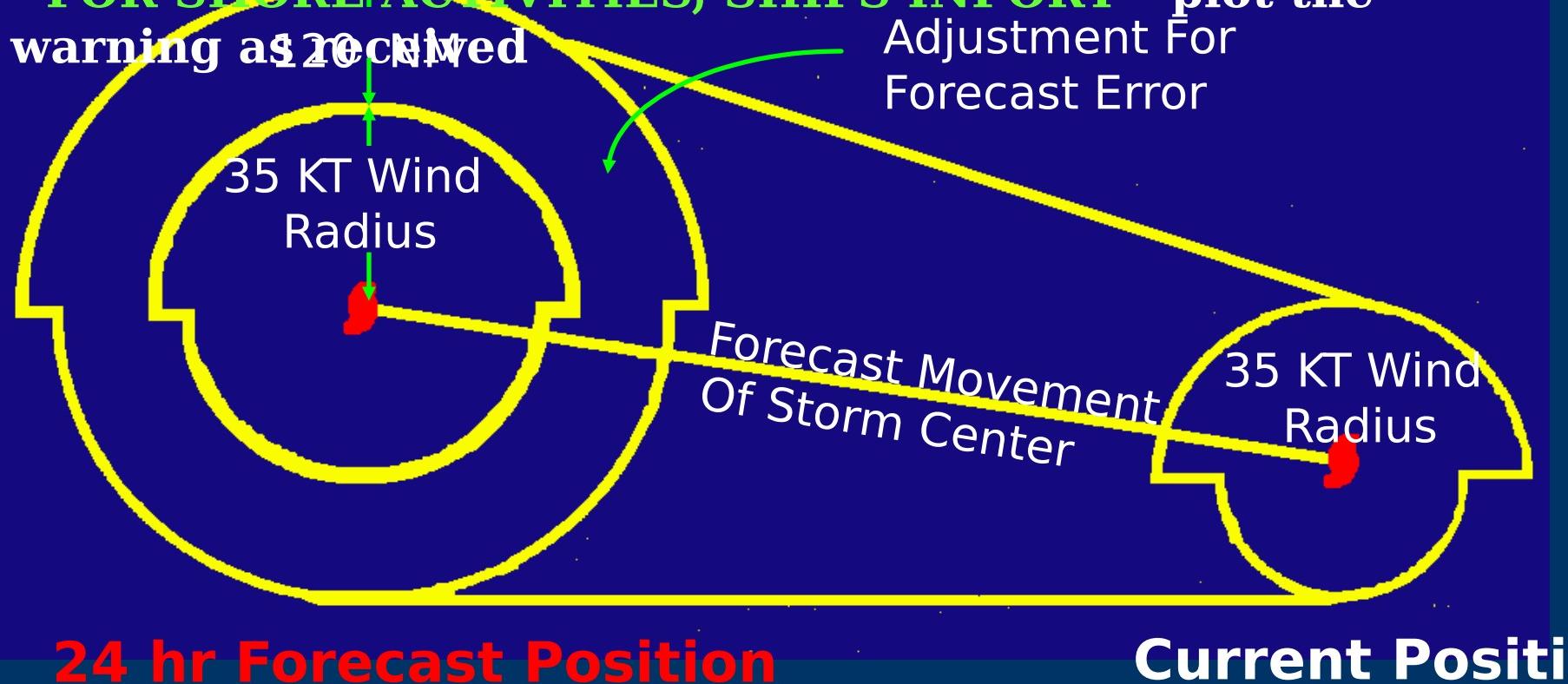
RADIUS OF
35 KT WINDS

COUNTER-CLOCKWISE
ROTATION OF WIND
ABOUT CYCLONE CENTER

Plotting the Danger Area

- FOR SHIPS AT SEA - add 120NM to the 24 hour 35 KT wind radius

- FOR SHORE ACTIVITIES, SHIPS INPORT - plot the warning as received



Maneuvering Considerations

- Seas on the dangerous semicircle of the storm may be up to 50 percent higher than seas on the navigable semicircle.
These high seas spread out ahead of the storm and may reduce SOA.
- Winds to the north and east of a northern pacific typhoon frequently remain at gale force hundreds of miles away from the storm center as the storm approaches any mid-latitude high pressure system.

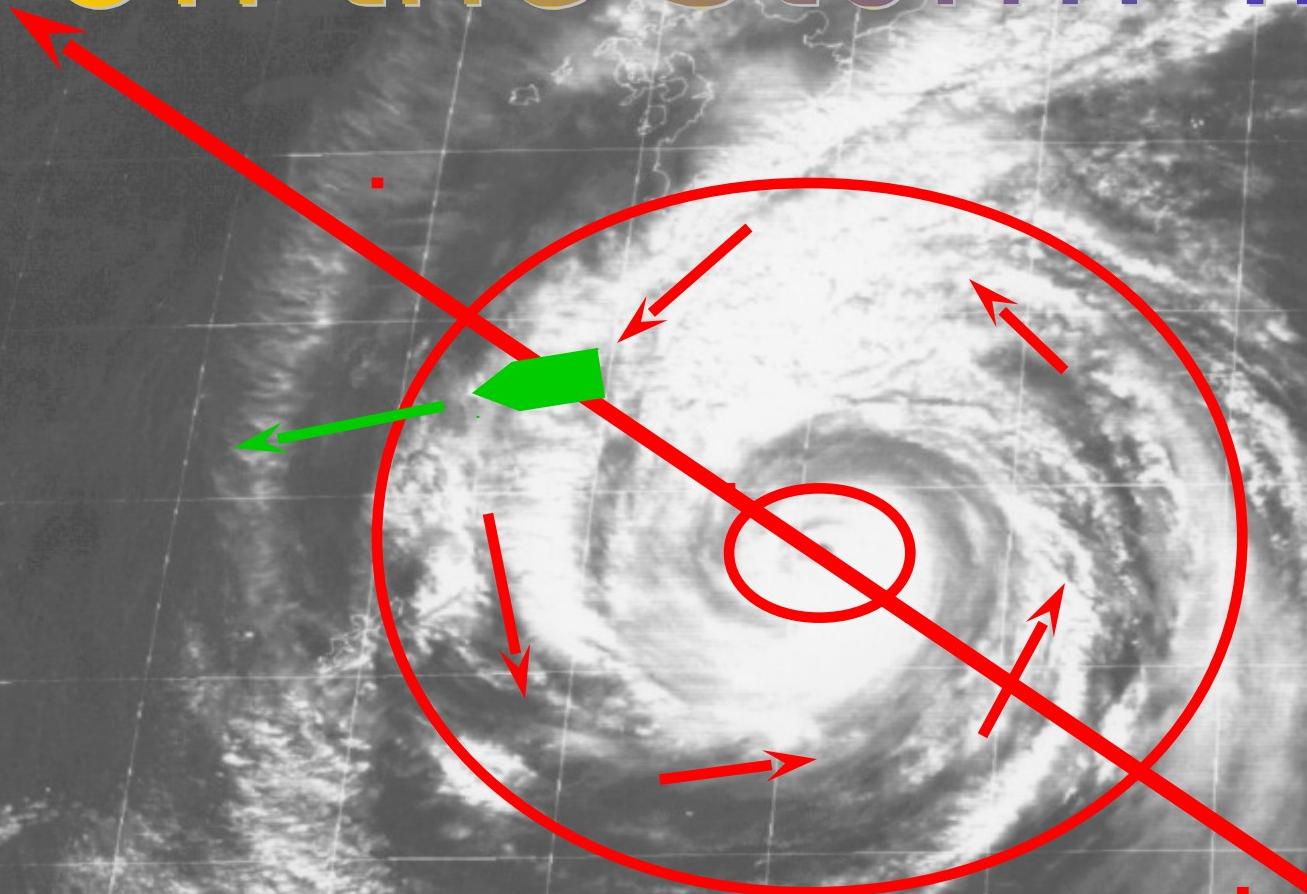
Tropical Cyclone Evasion (OPORD 201)

- There is no substitute for distance.
- Standard rules for avoiding tropical cyclones (N.H.):
 - On the track of a tropical cyclone
 - In the less dangerous semi-circle
 - In the dangerous semi-circle

Evasion on the Storm Track

- Bring the wind to the starboard quarter (160 relative) and maintain course.
- If wind direction stays the same or veers (turns clockwise) slowly, ship is still in the path of the storm.
- When the wind backs (turns counterclockwise) 15 degrees, ship is entering less dangerous semi-circle.

On the Storm Track

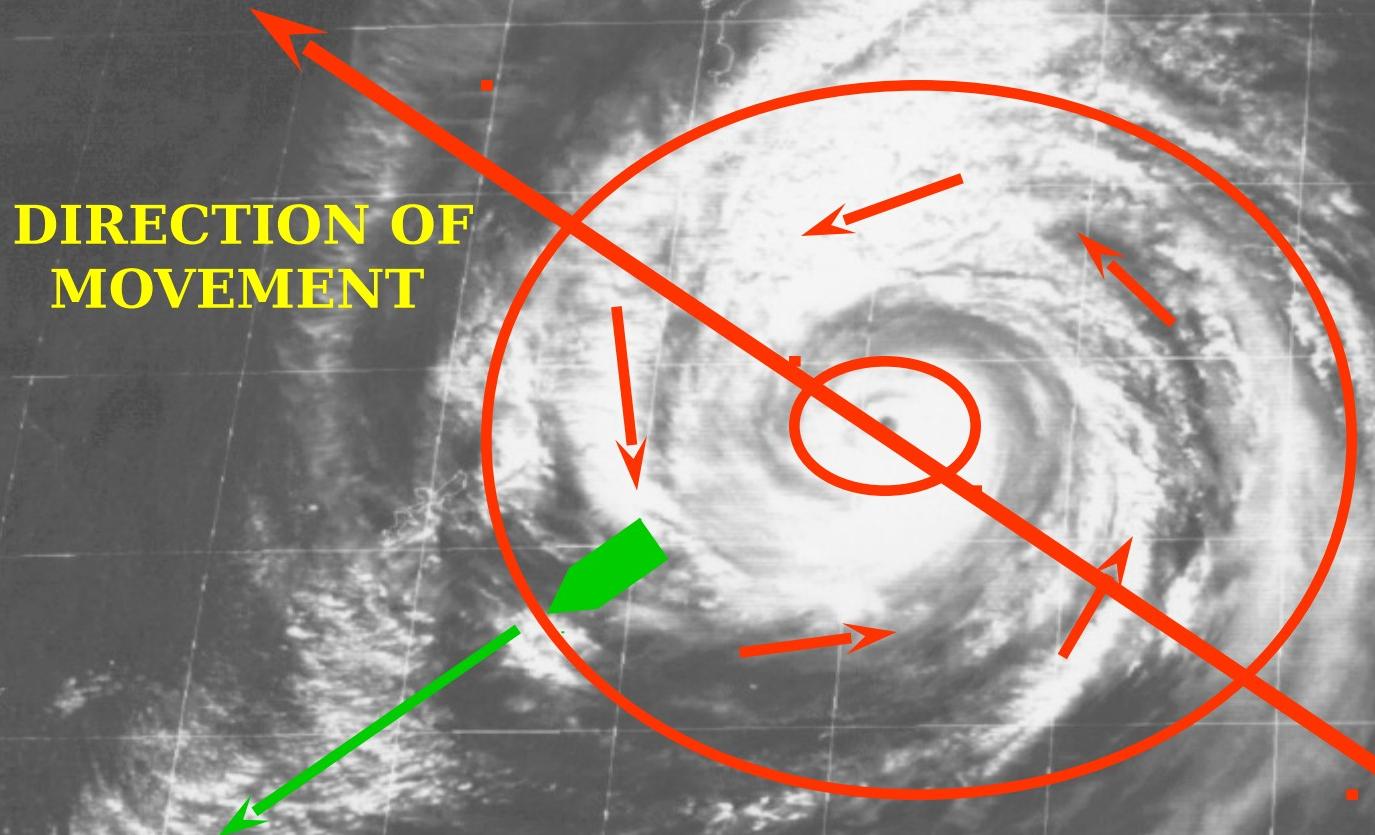


Evasion in the Less Dangerous Semi-circle

- Bring the wind on the starboard quarter (135 relative) and hold it there.
- Make as much headway as possible.
- If the wind backs (turns counterclockwise), the ship is in the less dangerous semi-circle.
- The tropical cyclone will pass astern.

Note: If the wind veers, the ship is in the dangerous semi-circle.

Less Dangerous Semi-circle

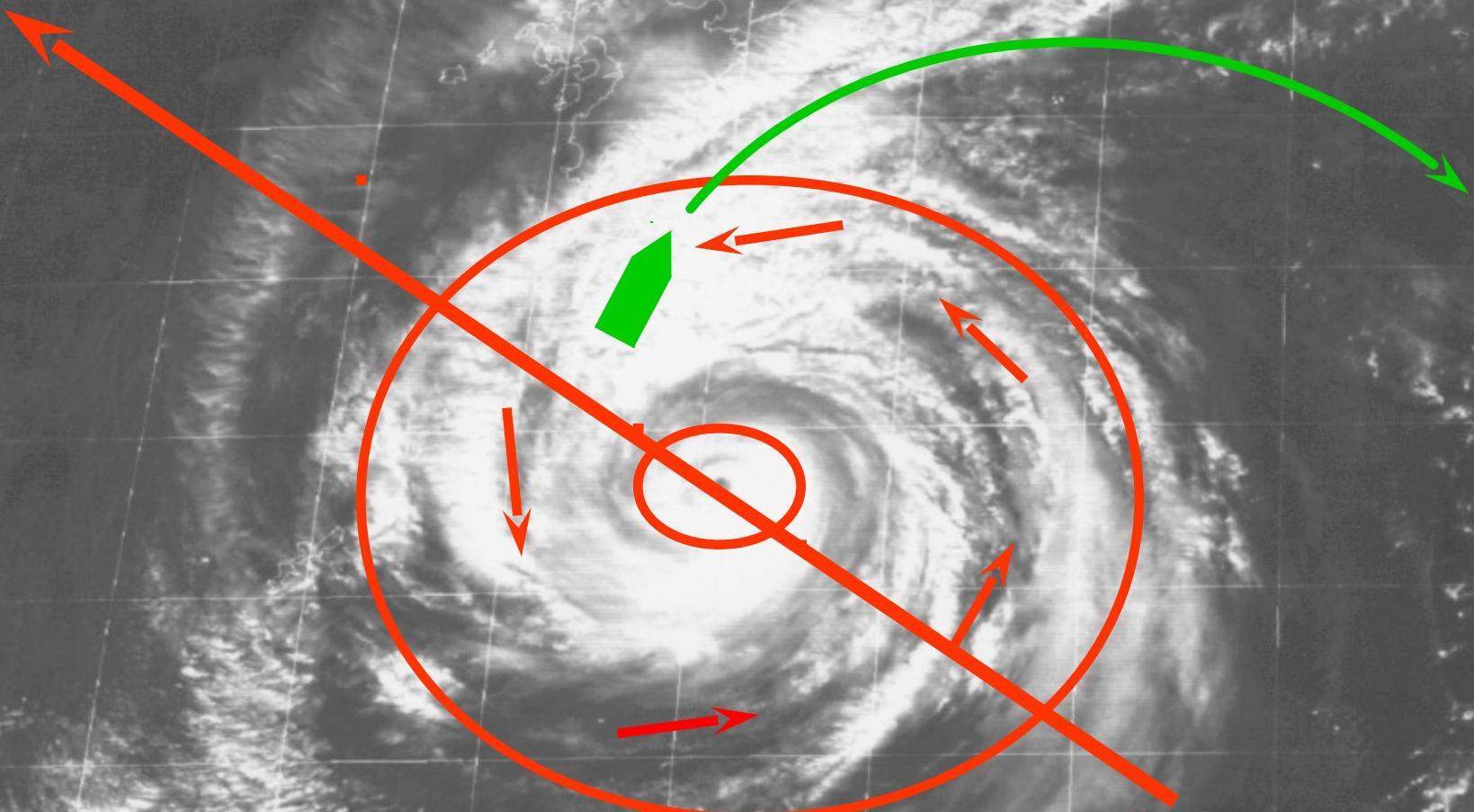


Less Dangerous
Semi-circle

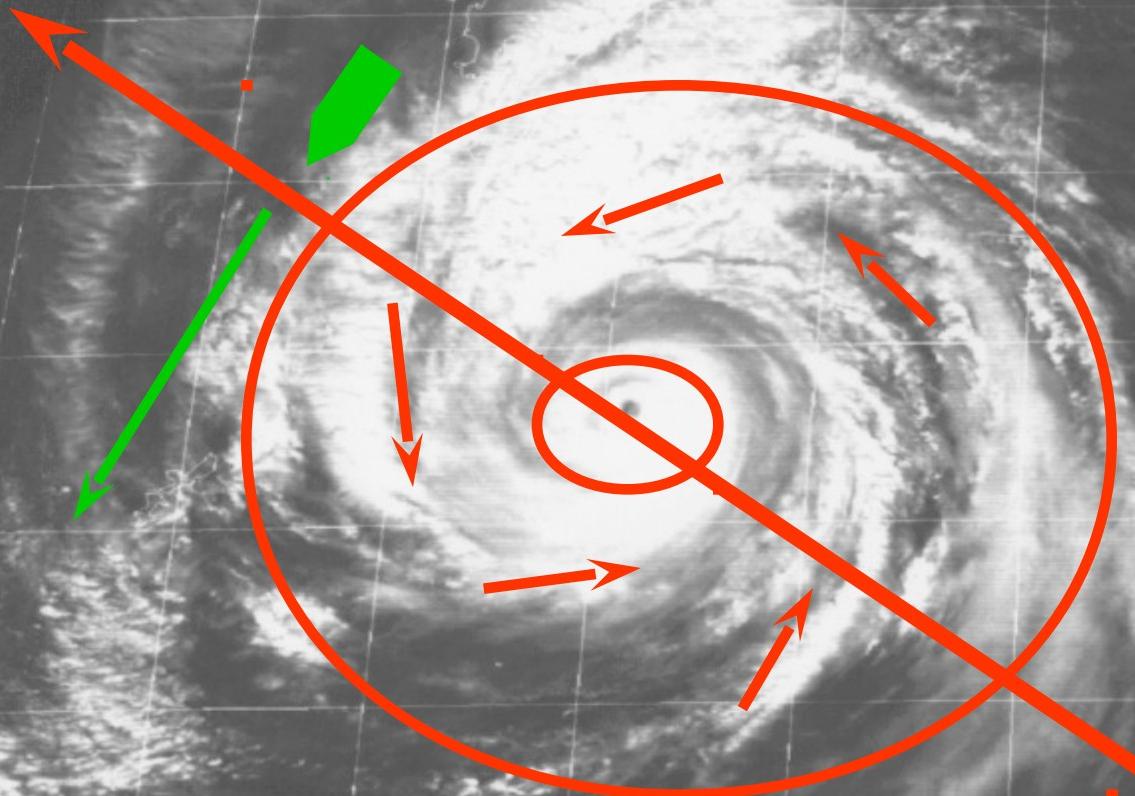
Evasion in the Dangerous Semi-circle

- Bring the wind on the starboard bow (045 relative).
- Make as much headway as possible.
- If the wind veers (turns clockwise), keep changing course to hold the wind on the starboard bow.
- The tropical cyclone will pass astern.

Dangerous Semi-circle



Crossing the "T"



Just say "no"!

TYPHOON EVASION

Warning Signs

- **HEAVY SWELLS WITH A LONG PERIOD (15-30SEC)**
 - can occur hundreds of miles ahead of storm
 - will arrive from general direction storm bear
- **PRESSURE DROPS 3.5MB (0.1 INS) IN 24 HRS**
 - large pressure changes in tropics are unusual
 - steadily falling pressure signals trouble
- **WINDS > 25 KNOTS OR ANY WESTERLY WIND**
 - NE trades usually blow at 10-20 knots
- **INCREASING CIRRUS LOWERING TO ALTOSTRATUS**
 - cirrus arrives about 24 hours ahead of storm
 - steady rain begins with altostratus

Typhoon Havens

GUAM

APRA HARBOR - **POOR**

CHINA

HONG KONG - **POOR**

JAPAN

SASEBO - **GOOD**

YOKOSUKA - **GOOD**

IWAKUNI - **MARGINAL**

OKINAWA - **POOR**

NUMAZU OPERA - **POOR**

KOREA

INCHON - **POOR**

PUSAN - **POOR**

CHINHAE - **MARGINAL**

Conditions of Readiness

TROPICAL CYCLONE CONDITIONS OF READINESS (TCCOR) are set by:

COMUSFORJAPAN (Kanto Plain)

- * Yokota
- * Atsugi
- * Hardy Barracks
- * Camp Zama
- * Camp Fuji

COMNAVFORJAPAN

- * Yokosuka Area
- * Sasebo Area
- * Iwo Jima (When US Forces deployed)
- * Iwakuni Area

Conditions of Readiness

- **TCCOR FOUR** - trend indicates a possible threat of destructive (> 50 KTS) winds or greater within **72 hours**.
- **TCCOR THREE** - destructive winds are possible within **48 hours**.
- **TCCOR TWO** - destructive winds are anticipated within **24 hours**.
- **MODIFIED TCCOR TWO** - winds greater than 32 KTS but less than 50 KTS are anticipated within **24 hours**.
Implementation of TCCOR 2 checklists is not mandatory.

Conditions of Readiness

- **TCCOR ONE** - destructive winds (> 50 KTS) are anticipated within **12 hours**. Since destructive winds are not imminent, routine operations can continue.
 - **TCCOR ONE CAUTION** - destructive winds are forecasted to occur within in **3 hours**.
 - **TCCOR ONE EMERGENCY** - destructive winds are occurring. Routine operations cease and manning is essential personnel only. **TCCOR ONE EMERGENCY** will last until the threat of destructive winds is over.
- **MODIFIED TCCOR ONE** - winds greater than 32 KTS but less than 50 KTS are occurring or anticipated within **12 hours**. Caution/Emergency alerts levels will not be implemented since the threat of destructive winds does not exist.

Required Reports

AT SEA

SYNOPTIC WEATHER OBSERVATIONS

- When within 300NM of a tropical cyclone or TCFA area, send via IMMEDIATE precedence every 3 hours

TYPHOON EVASION SITREPS

- Sent when experiencing 35KTS/12 FT seas due to a tropical cyclone, or when within the 24-hour danger area.
- Sent via IMMEDIATE precedence every 6 hours

MOVREPS

- Submit updated MOVREP when accepting OTSR Divert Recommendation.
- Every 24 hours if evading storm:
 - submit updated MODSTM MOVREP per NWP 1-03.1

Required Reports (con't)

SHIPS IMPORT AND SHORE ACTIVITIES

COR STATUS REPORTS

- Sent by CFAY and SOPA to appropriate Chain of Command when a higher Condition of Readiness is set

TROPICAL CYCLONE ADVISORY

- Sent by NAVPACMETOCSEN Yokosuka every 6 hours at intermediate synoptic times
 - Provides forecasted CPAs and local area weather expected from the tropical cyclone

Summary

- **NEVER cross the “T” of a tropical cyclone**
- **Most dangerous winds typically in right front quadrant**
- **Add 120NM to 24 hr 35 KT wind radius for danger area**
- **Transmit 3-hourly obs, 6-hourly sitreps when affected by a tropical cyclone**
- **Yokosuka is primary WESTPAC typhoon haven. Sasebo is second (except for large ships)**
- **Re-curving storms have greatest forecast errors**
- **Though multiple sources of data are available, JTWC is the official forecast for the U.S. Navy**

“There are no normal peacetime operations of greater importance than the avoidance of heavy weather damage.”
(OPORD 201)



REFERENCES

- USCINCPACINST 3140.1W
- CINCPACFLT OPORD 201 ANNEX H
- COMSEVENTHFLT OPORD 201 ANNEX H
- NAVOCEANCOMINST 3140.1K
- NAVOCEANCOMINST 3144.1D
- TYPHOON HAVENS HANDBOOK FOR THE WESTERN PACIFIC AND INDIA OCEANS, NAVENVPREDRSCHFAC TP 5-76
- USFJINST 32-1/COMFLEACTINST 3140.1S
- HEAVY WEATHER GUIDE/AMERICAN PRACTICAL NAVIGATOR VOL 1
- MARINERS WORLDWIDE CLIMATE GUIDE TO TROPICAL STORMS AT SEA NAVAIR 50-1C-61

NAVPACMETOCSEN

Numbers

Commanding Officer	243-5270
Operations Officer	243-7882
Mobile Environmental Team Officer 243-7849	
Command Duty Officer	243-5595

Home Pages:

www.yoko.npmoc.navy.mil

(NIPRNET/Internet)